GROUP OF GOVERNMENTAL EXPERTS OF THE STATES PARTIES TO THE CONVENTION ON PROHIBITIONS OR RESTRICTIONS ON THE USE OF CERTAIN CONVENTIONAL WEAPONS WHICH MAY BE DEEMED TO BE EXCESSIVELY INJURIOUS OR TO HAVE INDISCRIMINATE EFFECTS

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Explosive Remnants of War

Technical improvements and other measures for relevant types of munitions, including sub-munitions, which could reduce the risk of such munitions becoming ERW

Discussion Paper
submitted by
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This paper contains elements for further discussions of para 2 of the mandate for the CCW "Explosive Remnants of War" Group of Governmental experts established at the 2nd CCW Review Conference in December 2001.

Introduction

Large numbers of civilians are injured or killed each year by explosive remnants of war (ERW). Most become victims after the fighting has ended even when they were not the original target of the munitions when it was delivered or fired. While the impact of landmines has been well publicised for many years, the enduring threat from ERW has had a considerably lower profile. Munitions clearance programmes in dozens of countries now have to address the ERW issue, yet relatively little detailed technical information is available to assist them.

Amended Protocol II to the CCW and other international instruments already adequately deal with landmines as an important ERW problem, a possible new regulation should complement the existing ones that would cover the ERW issue which has not been regulated yet.

At the request of the Co-ordinator of the Group of Governmental Experts on ERW which was established at the 2001 Review Conference to discuss ways and means to address the issue of ERW, Switzerland has gathered information on technical improvements and other measures for relevant types of munitions which could reduce the risk of such munitions becoming ERW. This inventory is without prejudice to any other possible measure or arrangement that might reduce or eliminate ERW. It is for the purpose to support substantive discussions on the issue.

1. General remarks

The issue of ERW has different aspects. Due to the fact that the ERW problem is not a new one but has only been raised publicly recently, a prioritisation on the possible direct impact of ERW on the environment in all its aspects will help to focus on the immediate problem. Today's ERW challenge is primarily a consequence of mass produced and massively used ammunition. Large unitary bombs represent a certain category of the ERW problem but do not pose an imminent threat for the civil population after a conflict. For example, accidents of civilians with unexploded unitary bombs after a conflict are relatively rare compared with other types of ERW, although the disposal of such munitions is a dangerous and hazardous and sometimes very long-lasting undertaking. Basically the following mass produced and massively used munitions make up the ERW problem today: artillery shells, mortars, and submunitions from airborne cluster bombs or land-based system. These weapons have a high military utility during a military conflict. However, immediately after a conflict, unexploded ordnance from these weapons litter the battlefields and other areas and in many instances threaten the civilian population, cause a direct humanitarian emergency and hamper reconstruction efforts. As a consequence, this category of ERW needs to be prioritised.

The humanitarian emergency caused by this category of ERW is technically speaking mainly the combination of the presence of high explosives and a very sensitive fuse system which has been activated. Any contact with dangerous duds such as mortar shells or cluster bomb bomblets immediately provoke an explosion, kill persons standing nearby and complicate munitions clearance efforts. It goes without saying that these types of ERW have a direct impact on a number of post-conflict activities such as the resettlement of refugees and humanitarian assistance. Generally ordnance which has been stored or which was lost but has not been primed, fused or otherwise prepared for action and has not been fired, dropped, launched or projected is not considered to be an important ERW issue. Although their disposal might be hazardous and dangerous, they do not directly threaten civilians in the vast majority of situations. Indeed, the focus should be directed on high explosive ERW in the field which cause a humanitarian emergency since it is an immediate hazard after a conflict (annex 1).

2. General measures to reduce the number of ERW

2.1. Considering international standards

There are a number of possible approaches to achieving a less hazardous environment. One important element is the consideration of international standards (regarding, *inter alia,* the production process, ammunition management or testing of new products). Existing open standards (e.g. STANAG, MIL-Std) or the development of new guidelines would guarantee a high level of quality for such ammunition and would not only help to reduce the high amount of ERW in the field. It would also be an economic and military advantage for its users.

By considering international standards, the following general measures could effectively reduce the number of ERW:

- Quality of production

For example, apparent significant decrease in the quality result from the use of the wrong sealing compound. Even the best designs will not function if they are poorly manufactured or built using substandard materials.

Since there is little redundancy in mass produced munitions, each element must function correctly for the system to work. This requires a quality control process at every stage of manufacture.

- Ammunition management

Explosive ordnance are very sensitive systems. Inappropriate transportation and storage, such as the use of unsecured containers or unsafe stockpiling (for example ordnance that is not protected against weather conditions), can lead to a malfunction of the whole system. Extremes of temperature are likely to affect the performance of munitions, particularly where mechanical components are used.

- Minimising Deterioration of ammunition

Munitions can be well-manufactured but even the best manufactured munitions will deteriorate over time as metals corrode, plastics become more brittle and lubricants disperse or harden. Any such deterioration can increase the failure rate. Ammunition experts normally inspect stocks periodically, and may authorise extensions of the use of the ordnance if it is in good conditions. Old stocks may be refurbished and allocated a new period of service.

- Handling/charging

Because of the sensitivity of any explosive ordnance system, handling, especially charging, requires a competent and faultless execution. It does not allow for any mistakes, otherwise the danger of malfunctioning rises .

- Testing

Detailed tests are essential not just for manufacturers but also for operational use. Tests of acceptance should simulate a wide range of combat conditions and real-world terrain as well as be conducted over a broad range of climatic conditions.

2.2. Other measures to reduce the quantity of ERW

- Conditions of use

Most munitions systems incorporate some form of arming system to ensure the safety of the user. For example those systems that employ an arming mechanism spun by the airstream require a certain time in flight to be armed. Dropping a weapon too low increases the number of unexploded ordnance because the system has not been armed yet before impact.

- Accuracy of ammunition

Increasing the accuracy of certain ammunition does not inescapably reduce the amount of ERW but it does increase the chance of locating the point of impact and therefore allows for evaluation a possible footprint.

- Characteristics of terrain

Some munitions are designed to detonate on impact. The target has to offer substantial resistance. Soft ground can cushion the fall enough to prevent an impact fuse from functioning. Bushes or forested areas may have negative influence on the detonation of a system, as well.

3. Possible technical improvements to avoid humanitarian emergencies

Due to the humanitarian emergency caused by certain types of high explosive ordnance and the resulting need for a prioritisation of the ERW problem, some types of ammunition (e.g. mortar and artillery shells, submunitions, anti-aircraft ammunition) should be technically improved to reduce the immense amount of ERW (annex 2).

The following elements cover possible technical improvements for such ammunition:

- Self-destruction (SD)

This mechanism makes the unexploded ordnance explode in case of a malfunction of the primary fuse. Such a back-up system will clearly reduce the number of unexploded ordnance.

- Self-deactivation (SDA)

SDA as a secondary fuse, used in particular for electronic devices, deactivates the primary fuse. The primary fuse is armed but under certain circumstances, the munitions will not explode. In this case, the SDA makes sure that the primary fuse does not function any longer. The ERW still lays on the ground but is no longer as dangerous as without such a system.

- Self-neutralisation (SN)

SN as a secondary fusing system especially for pyrotechnical or mechanical systems permanently neutralises the ordnance. The disadvantage of SN is that the unexploded munitions is still intact. There must therefore be other indications or visible signs that the SN was effective and the ammunition can be safely handled and destroyed.

Self deactivation (SDA) and self neutralisation (SN) are similar technical solutions for disabling fusing mechanisms in duds after the end of the conflict. The difference is that self deactivation (SDA) applies to electronic fuses whereas self neutralisation (SN) applies to mechanical ones. Their effect however, is the same: they both reduce the direct and present danger of duds on the battlefield to military personnel and civilians.

- Detectability

To reduce the hazard from ERW, it is important that such ordnance is detectable and therefore can be removed by military or civil EOD teams without delay.

- Redundant fuse systems (RFS)

The functional reliability of a fuse can be improved by implementing of two (2) independent ignition systems in parallel, e.g. two (2) electrical or mechanical detonators in redundance (parallel and independent)

Annex 1

Prioritisation of ERW

	Not regulated yet	Humanitarian Emergency	High Explosive with sensitive fuse system	Mass production	Massive use
Large unitary bombs	**x**				
Rockets	**x**				
Artillery shells	**x**	**x**	**x**	**x**	**x**
Mortar shells	**x**	**x**	**x**	**x**	**x**
Submunition	**x**	**x**	**x**	**x**	**x**
Mines		**x**	**x**	**x**	**x**

Annex 2

Technical improvement to reduce the number of ERW

Ammunition	SD	SDA	SN	Detectability	RFS
Submunition	**x**		**x**	**x**	
HE Ammo of calibre more than 12.7mm	**x**	**x**		**x**	
Mortar Ammunition		**x**	**x**		**x**
Artillery Ammunition		**x**	**x**		**x**

Legend:

SD: Self Destruct Fuse
SDA: Self Deactivation Fuse
SN: Self Neutralisation Fuse
RFS: Redundant Fuse System